

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Barringer et al : GROUP ART UNIT: 2833
Serial No.: 09/942,306 : Examiner: T. Nguyen
Filed: August 29, 2001 : December 17, 2002
Title: PLUGGABLE PLANAR BOARD : Lawrence D. Cutter
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APPEAL BRIEF UNDER 37 C. F. R. § 1.192

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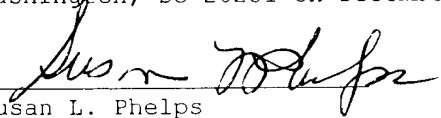
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

An appeal is hereby respectfully made to the Board of Patent Appeals and Interferences seeking a reversal of the Examiner's rejection of applicants' claims. Accordingly, it is respectfully requested that the arguments presented below in the above-entitled matter be fully considered on behalf of the applicants' request for reversal. Accordingly, please consider the items below which are submitted herein in accordance with 37 C. F. R. § 1.192.

CERTIFICATE OF MAILING UNDER 37 C.F.R. 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to the Board of Patent Appeals and Interferences, Assistant Commissioner for Patents, Washington, DC 20231 on December 18, 20002.


Susan L. Phelps

12/18/2002
Date of Signature

I. REAL PARTY IN INTEREST

The real party in interest in the above-identified patent application is International Business Machines Corporation, the Assignee of the invention.

II. RELATED APPEALS AND INTERFERENCES

None .

III. STATUS OF CLAIMS

Claims 1-6 are pending in the instant application. No claim has been canceled, and the rejection of claims 1-6 under 35 U. S. C. § 103 is hereby being appealed.

IV. STATUS OF AMENDMENTS

While the response under 37 C. F. R. § 1.116 was submitted to the Patent and Trademark Office on August 22, 2002, that amendment did not specify any changes that had to be made to applicants' claims in order to present them in better condition for appeal or to gain allowance thereof. Accordingly, it is noted that there are no amendments pending which have been submitted subsequent to a final rejection by the Examiner.

V. SUMMARY OF THE INVENTION

The present invention is directed to a printed circuit board assembly which is especially effective for insertion and removal even when it is fully populated with printed circuit cards. In this respect, it is particularly noted that the present invention is not directed to a printed circuit

card but rather to an entire printed circuit board assembly. The present invention is part of a system of related inventions directed to a circuit board assembly which may be easily and safely inserted and removed from a backplane or cabinet. Printed circuit boards are heavier, wider and include significantly more interconnections than individual printed circuit cards. Printed circuit boards typically span feet not inches. Accordingly, their insertion and removal requires the exertion of a significantly greater amount of physical force. As a result of the force requirements for insertion and removal and as a further result of the fact that these boards are large, there is a significant tendency for warping and twisting of the physical materials. If such motions are not controlled, breakage of conductive lines could result.

In order to provide the proper mechanical structure, a standard printed circuit board alone is not sufficient. In particular, the present invention includes a circuit board which has an electrical connector which is disposed along one of its edges. The motion of the printed circuit board is such that a force exerted by the mechanism shown in applicants' Figures 9, 10, and 11 causes the electrical edge connector to be mated with a corresponding connector on a backplane. However, the present invention calls for the presence of two other elements which operate to provide mechanical rigidity of a degree not required for simple printed circuit boards. In particular, the circuit board assembly of the present invention also includes a nonconductive base which is substantially coextensive with the printed circuit board. The base is provided on one side of the printed circuit board. On the other side of the printed circuit board, there is provided a stiffener which is also substantially coextensive with the printed circuit board. The presence of a non-conductive base permits the inclusion of an insertion and removal mechanism such as that shown in the above-mentioned Figures 9, 10 and 11. The nonconductive base also provides a degree of rigidity. This rigidity is even further enhanced by the presence of a stiffener disposed on the opposite side of the printed circuit board. The stiffener is also employable to provide EMI shielding.

VI. ISSUES

The only issue present in the current application is the rejection of claims 1-6 under 35 U.S.C. § 103 based upon the patent to Aoki, et al. (U.S. Patent No. 6,288,911) in view of the patent to Sasaki (U.S. Patent No. 5,329,422).

VII. GROUPING OF CLAIMS

Separate patentability considerations are specifically directed to applicants' claim 5 and claim 6 which depends from claim 5. In particular, claim 5 recites material not found in any of the cited art.

VIII. ARGUMENT

A. Arguments with respect to all claims

It is the applicants' position that neither of the two cited patent documents teach, disclose, or suggest the utilization or construction of a printed circuit board having an edge connector which also includes base and stiffening members.

It is to be particularly noted in the discussions herein with respect to the present invention that a significant distinction is to be made between a printed circuit card and a printed circuit board. As contemplated in the present invention, a printed circuit board is a large structure into which printed circuit cards are inserted. This structure can range up to several feet in length and width. Naturally, its height will depend upon the height of the printed circuit cards which are inserted into the board. Because of their large size and because of the presence of a plurality of already inserted printed circuit cards, printed circuit boards of the present invention are subject to mechanical stresses and to bending not present in printed circuit cards or in other smaller structures.

With respect to the patent to Aoki et al., there is apparently disclosed a printed circuit board member into which cards 19 (see their Figure 5) are inserted. However, it is noted that the printed circuit board assembly in Aoki et al. is fixed. It is not moveable; it is not meant to be either removed from or inserted into any structure. Accordingly, there are no edge connectors provided for this purpose. The only connectors so provided are for the insertion of printed circuit cards 19. For this purpose, connectors are provided on the surface of printed circuit boards 15 (see their Figure 5). The printed circuit board in Aoki et al. is never meant to be used separate and apart from the single, permanent cabinet or frame in which it is installed. The printed circuit board assembly in Aoki et al. never has printed circuit cards installed in it except when the printed circuit board is contained within the described frame. This frame is essential for the insertion and removal of printed circuit cards in the system described in Aoki et al. In particular, frame or cabinet 61 must be present to provide a structure against which lever 33 operates so as to push printed circuit card 19 into electrical connector 17. This is not how applicants' present invention operates.

It should also be particularly noted that the overall system of the present invention contemplates the existence of a printed circuit board which is fully populated with printed circuit cards, that is, cards which are already inserted into and in electrical contact with the board. It is to be particularly noted that in applicants' system, there is no requirement for an external frame. Rather, in applicants' system, the printed circuit cards are disposed in individual cartridges which include guide rails 111 which mate with corresponding guide slots 351 in guides 350 disposed on the printed circuit board.

Since Aoki et al. do not contemplate the separate existence of a fully populated printed circuit board with its wide and massive properties, Aoki et al. do not appreciate the problem solved by means of the claimed invention.

The examiner attempts to argue that frame 61 shown in Aoki et al. serves as a stiffening member. This is in fact not the case. In particular, it is noted that in order to achieve insertion of printed circuit cards in the system described by Aoki et al., it is necessary to exert a force downward from top 63 of frame 61 against printed circuit card connectors 17. This force is exerted downwardly in central portions of printed circuit board counterpart 15 shown in Aoki et al. There is no teaching, disclosure, or suggestion that frame 61 provides any degree of resistance or protection against flexing motions due to these downward forces. This is a very important distinction to note since applicants' claimed printed circuit board system, including the present invention and other related inventions, does not employ forces of this nature. In stark contrast, the insertion forces for printed circuit cards in the present invention are directed very locally through the utilization of guide structures 350 which mate with guide rails 111 on cartridge 110 (see applicants' Figure 1A). In this regard, attention is also directed to applicants' Figure 6 which particularly shows guide rail 111 disposed within a corresponding portion 351 of guide 350 mounted locally on printed circuit board 300. In this respect, attention is also specifically directed to applicants' claim 5.

When one is talking about printed circuit board assemblies, which can range upward of two feet by two feet in size, external forces of the kind required by the structure in Aoki et al. produce undesirable levels of bending because the claimed structure in applicants' invention is not present. Furthermore, it is to be particularly noted that the externally exerted downward forces required by Aoki et al. would tend to strain any electrical connections made between a printed circuit board and a backplane. However, as pointed out above, Aoki et al. do not teach, disclose, or suggest that their printed circuit board assembly is ever meant to be moved, inserted, or used outside of its frame either with or without printed circuit cards installed. In particular, the system in Aoki et al. requires the presence of frame 61. Aoki et al. do not contemplate the presence of printed circuit cards within their printed circuit board unless and until that board is surrounded by an external frame. Furthermore, the external frame is required to be such that it

provides a fixed object against which lever 33 may be moved in order to force printed circuit card 19 into connector 17.

It is a well-settled principle of patent law that cited art which does not appreciate the problem solved by a claimed invention cannot be used as a basis for rejecting claims directed to solving that problem. This is certainly true in the case of Aoki et al. Their system is different. Their forces are different and they in no way contemplate the structure or utilization of a printed circuit board which may itself be removed and inserted in spite of the fact that it is already fully populated with a plurality of printed circuit cards already in place.

Attention is now specifically directed to the alleged combination of teachings from the patent to Aoki et al. and from the patent to Sasaki. In this respect, it is to be particularly noted that the patent to Sasaki is directed essentially to a notebook or laptop computer. As such, it is incapable of having dimensions commensurate with those which give rise to bending problems on printed circuit boards. Furthermore, while it might be suggested that such laptop devices include printed circuit "boards," such "boards" are not of the kind which are adapted or intended to receive printed circuit cards. Accordingly, the mechanical bending and the stress related aspects present in devices contemplated by the present applicants are not taught, disclosed, or suggested by Sasaki.

Furthermore, due to the disparate nature of the two patents cited by the examiner, it appears clear that the examiner is merely applying hindsight reconstruction. There is no teaching or suggestions found in the patent to Sasaki, since it relates to notebook PC devices, which would suggest that the structures found in those devices be incorporated into electronic systems having a much larger scale factor. Furthermore, it is the plain and unequivocal understanding in Sasaki that any structure found therein which provides stiffening for a printed circuit board is

also a structure which completely surrounds the board and which precludes its insertability or removability from other structures.

Furthermore, it is noted that the question of hot pluggability for the entirety of a printed circuit board" found in a notebook or laptop PC is an irrelevant issue. There is only one printed circuit "board" in such devices and it is not removable nor is it ever intended to be removed particularly in a hot pluggable fashion. Furthermore, even if it were removable and hot pluggable, such "boards" still do not possess the size or weight which would produce mechanical problems upon insertion or removal.

Apart from the fact that there does not appear to be any reason or suggestion for combining the teachings from the two cited patents apart from hindsight reconstruction, it is still seen that even if the suggested combination is made, the resulting structure would not function in the manner intended for the claimed invention. In particular, the teachings of Sasaki would require that the stiffening addition completely surround the printed circuit board in a manner which would render it incapable of being removed or inserted from any other structure. The structure that results from the combination produces a printed circuit board which is surrounded by an assembly that precludes its electrical interconnections with a backplane.

The examiner has characterized connectors 17 on board 15 from the patent to Aoki et al. as being disposed on an edge thereof. This is not the case. In the electrical arts, when one speaks of a connector being on the edge of a printed circuit board, it is anticipated that this is something different from a connector being mounted on the surface of the board. An edge mount is not a surface mount. Clearly and unequivocally in the context of the edge connector arts, or more generally in terms of the arts relating to connectors and printed circuit cards and boards, the recitation of a connector being along an edge is clearly distinguished from the situation in which a connector is disposed on the surface of a board. With respect to the patent to Aoki et al.,

connectors 17 are disposed on the surface of board 15. They are not disposed on the edge of the board. Connectors 17 could not be used to provide electrical connection between a printed circuit board and a backplane into which the board is inserted by motion directed in the plane of the board. Connectors 17 are solely for the purpose of providing electrical connection between printed circuit cards 19 and circuit board 15 of Aoki et al. The examiner's recitation of the definition of "edge" from a standard dictionary is misplaced. In this regard, attention is specifically directed to applicants' specification, paragraph 74, page 19, wherein it is stated that "Figure 7 also indicates the inclusion of rear board edge connector 340 disposed on the back edge of board 300." For the purpose of better understanding the present invention, particular note should be given to the size, length, and extent of edge connector 340. Clearly, this is an edge connector intended to provide electrical connections when the board is removed and inserted into a backplane. As further evidence of the mechanical difficulties associated with this process, it is to be particularly noted that the present applicants have had to find a specific mechanical set of levers, a pinion gear, and a rack device for producing the appropriate levels and directions of physical force. In this respect, attention is directed to applicants' Figures 7, 9, 10, and 11. In preferred embodiments of applicants' invention, this mechanical structure is metal and is provided within recesses formed in the claimed insulative base member. Attention is also directed to the direction of the applied insertion force (that is, in the plane of the circuit board) for a better appreciation of the meaning to be given to the term "edge connector."

Accordingly, it is seen that the examiner's reference to a conventional dictionary is inappropriate and misses the mark. In particular, it is clear that in the context of the present invention, reference is made to circuit board edge connection devices. Those of ordinary skill in the art fully appreciate that an edge connector is disposed on an edge of a card or board, not on the surface. In furtherance of this position, it is noted that printed circuit cards are themselves typically referred to as having edge connections. This is the case in applicants' claimed invention, as it is also the case in the patent to Aoki et al. when Aoki et al. refer to print circuit

cards. Again, clear distinctions must be made herein between a printed circuit board which is normally not intended to be insertable or removable and printed circuit cards which are generally intended to be insertable and removable. The mechanics are different and the problems are different, particularly when the printed circuit board is to be inserted and removed when already fully populated with a set of printed circuit cards already in place.

Accordingly, it is seen that neither Aoki et al. nor Sasaki teach, disclose, or suggest the claimed edge connector present in applicants' claimed invention nor do they provide any indications that one would employ a base member and/or a stiffener both of which are substantially coextensive with the printed circuit board, as is specifically recited in applicants' claims 1-6.

B. Arguments with respect to claims 5 and 6

As indicated above, even if patentability were to be denied to applicants' claims 1-4, it is nonetheless indicated that applicants' claim 5 recites subject matter which is nowhere taught, disclosed, nor suggested by either of the two cited patents, nor by any of the other documents cited by the examiner. In particular, applicants' claim 5 specifically recites the inclusion of guides (see reference numeral 350) which have slots which extend substantially parallel to the printed circuit board. These are slots 351 shown in applicants' Figures 6, 7, and 8. These horizontally disposed slots are intended for mating with ridges 111 on cartridges 100. In this regard, it is to be particularly noted that applicants' claimed invention is intended for operation with printed circuit cards which are separately disposed in cartridges. It is this separate cartridge system which permits the independent insertion and removal of printed circuit cards without the existence of a surrounding frame, cabinet, or other structure. Thus, in applicants' claimed invention, it is common to have printed circuit boards which include cartridge-based printed circuit cards already deployed on the printed circuit boards. Applicants' invention does not

require or rely upon any other external structure for the insertion and removal of printed circuit cards into their printed circuit board. In order to provide this function, the printed circuit cartridges are provided with ridges or guides 111 which slide into horizontally disposed slot 351 in guide 350. In this regard, attention is specifically directed to paragraph 52 on page 12 of applicants' specification wherein it is recited that "Ridge 111 may possess any convenient cross-section, however, a smooth-rounded cross-section is shown. The main feature of ridge 111 is that it possesses a cross-section which matches the cross-section of slots 351 provided in guides 350 (see Figure 10) affixed to printed circuit board 300." No such guide structure is taught, disclosed, or suggested in either of the cited patents. The only guide structure taught by Acki et al. is a structure present on top portion 63 of frame 61. It is clearly not a guide which is affixed to a printed circuit board.

Accordingly, it is seen that a separate basis for patentability exists for applicants' claim 5 and also for claim 6 which depends therefrom.

It is therefore seen that, for all of the reasons above, applicants' claimed invention is not in fact rendered obvious in view of the teachings from the two cited patents. It is thus respectfully requested that the rejections of claims 1-6 under 35 U.S.C. § 103 be reversed. This reversal is thus respectfully requested.

IX. APPENDIX

Claim 1.

A circuit board assembly which is especially effective for insertion and removal even when fully populated with printed circuit cards, said circuit board assembly comprising:

a printed circuit board having an electrical connector disposed along one edge thereof;

a nonconductive base substantially coextensive with said printed circuit board upon which said printed circuit board is mounted; and

a stiffener disposed on said printed circuit board on the side thereof opposite said base, said stiffener also being substantially coextensive with said printed circuit board.

Claim 2.

The circuit board assembly of claim 1 in which said stiffener is metal.

Claim 3.

The circuit board assembly of claim 1 in which said base is a polymeric material.

Claim 4.

The circuit board assembly of claim 1 in which said printed circuit board further includes electrical connectors disposed thereon for insertion of printed circuit cards, said connectors for insertion of said printed circuit cards extending through apertures in said stiffener.

Claim 5.

The circuit board assembly of claim 4 further including a plurality of guides having slots therein with said slots being aligned with and disposed adjacent to said printed circuit card connectors, said slots extending substantially parallel to said printed circuit board.

Claim 6.

The circuit board assembly of claim 5 in which said guides are affixed to said stiffener.

RESPECTFULLY SUBMITTED

Date: Dec. 17, 2002

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